Foreward

How Forecasts Are Made

Most of the annual streamflow in the Western United States originates as snowfall. This snowfall accumulates high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are viewed in conjunction with snowpack data to prepare runoff forecasts. This report presents a comprehensive picture of water supply outlook conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data and narratives describing current conditions.

Streamflow forecasts are cooperatively generated by Soil Conservation Service and National Weather Service hydrologists. Forecasts become more accurate as more data affecting runoff becomes known. For this reason, forecasts are issued that reflect three future precipitation conditions -- Below Normal, Average, and Above Normal. These forecasts are termed reasonable minimum, most probable, and reasonable maximum. Actual streamflow can be expected to fall between the lower and upper forecast values eight out of ten years.

Snowpack data are obtained by using a combination of manual and automated measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation, temperature, and other parameters are monitored on a daily basis and transmitted via radio telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

For More Information

Copies of Monthly Water Supply Outlook Reports and other reports may be obtained from the states listed below. Because of the limited space, snow survey measurements are not published in monthly reports. An annual snow survey data summary is published by the Soil Conservation Service for each of the western states. Historical snow survey data may be obtained at those same offices.

ADDRESS STATE

Alaska 201 East 9th Ave., Suite 300, Anchorage, AK 99501-3687

201 East Indianola, Suite 200, Phoenix, AZ 85012 Arizona

2490 West 26th Ave., Denver, CO 80211 Colorado (New Mexico)

304 North 8th Street, Room 345, Boise, ID 83702 ldaho

10 East Babcock, Room 443, Federal Building, Bozeman, MT 59715 Montana

50 South Virginia Street, Third Floor, Reno, NV 89505 Nevada 1220 Southwest 3rd Ave., 16th Floor, Portland, OR 97204 Oregon

4402 Federal Building, 125 South State Street, Salt Lake City, UT 84147 Utah

360 U.S. Court House, Spokane, WA 99201 Federal Building, 100 East "B" Street, Casper, WY 82602 Wyoming

in addition to state reports, a Water Supply Outlook for the Western United States is published by the Soll Conservation Service and National Weather Service monthly, January through May. Reports may be obtained from the Soil Conservation Service, West National Technical Center, 511 Northwest Broadway, Room 547, Portland, OR 97209.

Published by other agencies:

Washington

Water Supply Outlook Reports prepared by other agencies include: California - Snow Survey Branch, California Department of Water Resources, P.O. Box 388, Sacramento, CA 98502; British Columbia -Ministry of Environment, Water Investigations Branch, Parliament Buildings, Victoria, British Columbia, V8V 1X5; Yukon Territory — Department of Indian and Northern Affairs, Northern Operations Branch, 200 Range Road, Whitehorse, Yukon Territory, Y1A 3V1; Alberta, Saskatchewan, and N.W.T. — The Water Survey of Canada, Inland Waters Branch, 110-12 Avenue S.W., Calgary, Alberta, T3C 1A6.

Arizona Water Supply Outlook

and

Federal-State-Private Cooperative Snow Surveys

Issued by

Wilson Scaling Chief Soil Conservation Service Washington, D.C.

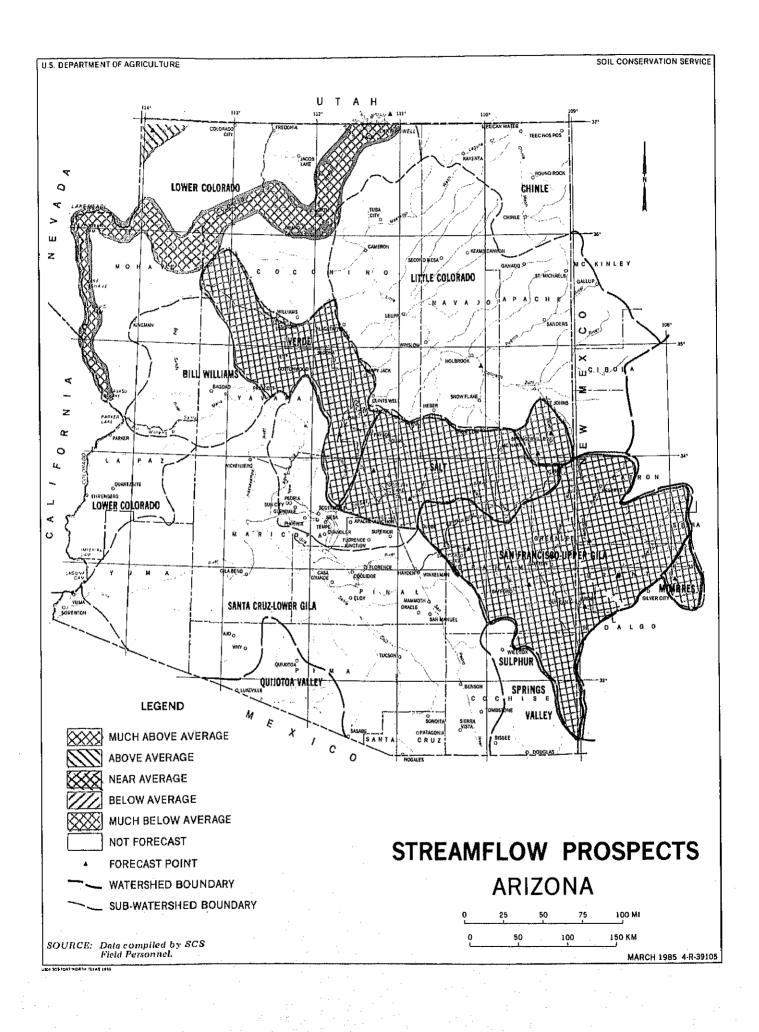
Released by

Verne M. Bathurst State Conservationist Soil Conservation Service Phoenix, Arizona

Prepared by

Ronald A. Jones Water Supply Specialist Soil Conservation Service 201 E. Indianola Ave., Suite 200 Phoenix, Arizona 85021

'Programs and assistance of the United States Department of Agriculture are available without regard to race, creed, color, sex, age, or national origin.'



GENERAL OUTLOOK

SUMMARY:

March precipitation and snowmelt produced an increase in streamflow for the month, but the April-May outlook still calls for below average runoff. The April 1 snowpack was much below average and little snow is left except in the San Francisco Peaks, the Chuska Mountains, and the interior parts of the White Mountains. The Salt River is forecast to run 51% of average, Tonto Creek 42% and the Verde River 44%. The San Francisco River should run in the 60% range and the Gila 60%-65%. The Little Colorado is forecast at 68% at Greer and 54% at Lyman Reservoir. Inflow to Lake Powell is forecast to be 144% of average over the April-July period.

SNOWPACK:

Much below average snowpack remains on April 1. Snow surveys and telemetry data showed that the snowpack of Arizona and western New Mexico had continued its up and down pattern during March just as it had all winter beginning in late November. Dry conditions in December and January, coupled with periods of warm temperatures depleted the snow from November. Snow received from early and mid February storms melted due to much above average temperatures in late February. Early and mid March storms again built up the mountain snow only to have it melt from another period of warm weather. Only special areas such as the San Francisco Peaks and the Chuska Mountains deviated very much from this pattern.

Snowpack - Percent of Average

Basin	March 1	March 15	April 1
Salt River Verde River San Francisco/	34 23	51 40	23 29
Gila River	38	53	25
Little Colorado River	40	37	15
Grand Canyon	63	79	58
Mimbres River	7	73	0
San Francisco Peaks	99	97	106
Chuska Mountains (est.)	90	82	73

PRECIPITATION: Precipitation during March was above average on all forecast basins, ranging from 105% on the lower Colorado River area of northwestern Arizona to 162% on the Mimbres watershed in New Mexico. Most of this precipitation came during the first three weeks of the month with a major storm from March 15 to 18. The general March precipitation and temperature pattern was almost a duplicate of that experienced in February.

RESERVOIRS:

April 1 reservoir storage is above average and most large water supply impoundments are nearly full. The Salt River Project system reported 97% of capacity storage with 1,966,000 acre feet. San Carlos was 97% full with 905,000 acre feet. Lake Pleasant held 89,000 acre feet at 57% of capacity. A combined storage of 47,513,000 acre feet was being held in Lakes Powell Mead, Mohave, and Havasu, accounting for 89% of their capacity. Smaller reservoirs increased their storage from March runoff. Lyman Lake reported 27,400 acre feet in storage. Show Low Lake held 3100 acre feet. Watson Lake and Willow Lake each held 4400 acre feet.

STREAMFLOW:

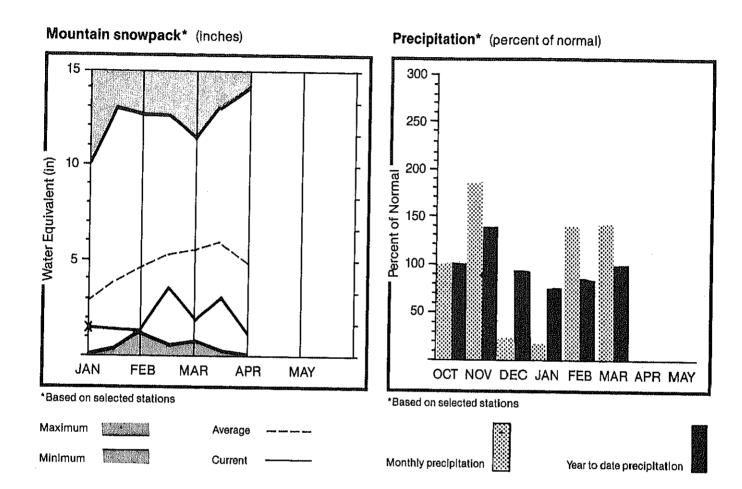
Streamflow increased during March in response to a two edged condition remininiscent of February. Rain from the storms of early and mid March produced increased streamflow while snow was building at the higher elevations. When the weather cleared near the 19th, abnormally warm temperatures set in and accelerated snow melt resulted. Streamflow volumes increased further. Many streams produced normal to above normal runoff for the month.

Preliminary Streamflow Observations March, 1986

Stream	1000's acre feet	Percent of average
Salt River	152.2	121
Verde River	96.5	96
Tonto Creek	44.4	130
Gila River	24 0	94
Virden	24.8	
Solomon	41.4	74
Calva	37.8	90
San Fransico River		
Clifton	17.3	69

All streamflow forecasts are coordinated between the Soil Conservation Service and the National Weather Service. All averages and percentages of average are based on the 20 year period 1961-1980.

Salt River Basin



April 1, 1986

WATER SUPPLY OUTLOOK:

The Salt River is forecast to produce 51% of average runoff and Tonto Creek, 42% over the April-May period. March precipitation was 140% of average but the April 1 snowpack was only 23% of average. Warm temperatures in late March melted much of the snow. This, coupled with rain runoff, produced above average March streamflow. Salt River Project reservoirs on the Salt River were 99% full on April 1 with 1,687,000 acre feet in storage. Lake Pleasant reported 89,000 acre feet at 57% of capacity.

SALT RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	HOST PROBABLE (% AVE.)	REAS. HAX. (% AVE.)	REAS. HIN. (% AVE.)	PEAK FLOH (CF8)	PEAK Date	LOH Floh (CFS)	LOH DATE
SALT RIVER near Roosevelt	APR-HAY APRIL	204.1 130.7	105.0 73.0	51 55	117	21				
TONTO CREEK near Roosevelt	APR-HAY APRIL	14.2 11.2	4.0 5.0	42 45	134				· · · · · · · · · · · · · · · · · · ·	

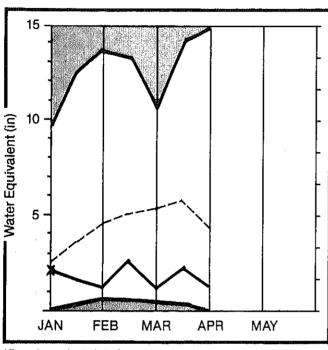
	RESERVOIR STORAGE	(1000AF)	WATERSHED	SNOWPACK AN	IALYSIS
RESERVOIR	USEABLE I CAPACITYI I	** USEABLE STORAGE ** THIS LAST YEAR YEAR AVE.	WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF LAST YR. AVERAGE
SALT RIVER RES SYSTEM LAKE PLEASANT	1709.0 157.6	1467;1 1452;4 1263;0 98;6 122;9 85;0	l	8	23 22

[#]Corrected for upstream diversions or changes in reservoir storage.

Average is for 1961-80 period.

Verde River Basin

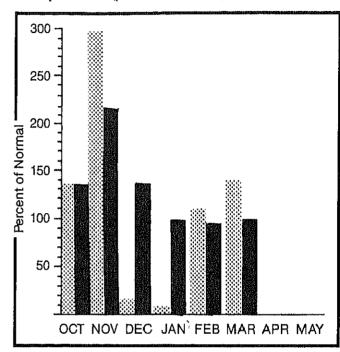
Mountain snowpack* (inches)



*Based on selected stations



Precipitation* (percent of normal)



*Based on selected stations

Monthly precipitation

Year to date precipitation

April 1, 1986

WATER SUPPLY OUTLOOK:

The April-May forecast on the Verde river calls for 44% of average runoff. Five hundred acre feet or less is expected to enter Lake Mary or flow in Granite or Willow Creek. March precipitation was 139% of average which produced near average runoff on the Verde River for the month. Even though snow was deposited on the basin, most of it melted by late March. The April 1 snowpack was only 29% of average. Because of its higher elevation the San Francisco Peaks snow was still 106% of average. Salt River Project reservoirs on the Verde River had an April 1 storage of 279,000 acre feet at 90% of capacity. Watson and Willow Lakes each held 4400 acre feet.

VERDE RIVER BASIN

STREAMFLON FORECASTS

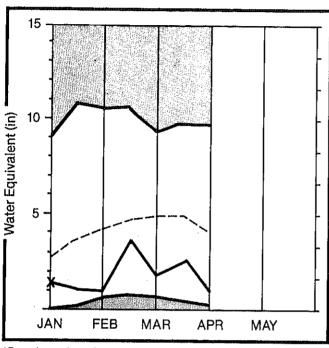
FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	MOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. HAX. (% AVE.)	REAS. MIN. (% AVE.)	PEAK FLON (CFS)	PEAK Date	LOH FLOH (CFS)	LOH DATE	` .
VERDE RIVER above Horseshoe	APR-HAY APRIL	81.1 65.6	36.0 26.0	44 39	171	17	:				·
GRANITE CREEK	APR-HAY		0.5								-
HILLON CREEK	APR-HAY		0.4							1	
LAKE MARY INFLOW	APR-MAY		6,0		i de la la esta Maria de la comoción de la comoción Maria de la comoción					•	

***************************************	RESERVOIR STORAGE	(1000AF) 	I HATERSHED SNOWPACK ANALYSIS					
RESERVOIR	USEABLE I Capacityi i		HATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF			
VERDE RIVER RES SYSTEM	307.6	278.6 308.6 162.9	VERDE RIVER	10	27 20			
HATSON LAKE	4,7	14 15 16	SAN FRANCISCO PEAKS	. 4	75 106			
HILLON CREEK	6.1		i *					

^{*}Corrected for upstream diversions or changes in reservoir storage. Average is for 1961-80 period.

San Francisco - Upper Gila River Basin

Mountain snowpack* (inches)

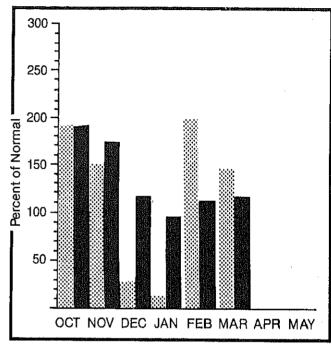


*Based on selected stations



Average ————
Current

Precipitation* (percent of normal)



*Based on selected stations

Monthly precipitation

Year to date precipitation

April 1, 1986

WATER SUPPLY OUTLOOK:

Below average April-May streamflow is forecast on the Gila basin. The San Francisco River is only expected to produce 61% of average at Clifton. The Gila River is forecast to run 65% at Virden, 59% at Head of Safford Valley, and only 26% at Calva. March precipitation was 146% of average over the basin. Warm temperatures in late March melted much of the snow and the April 1 snowpack was only 25% of average. March runoff was below to near average even with the precipitation and snowmelt. San Carlos reservoir was 97% full on April 1 with 905,000 acre feet in storage.

SAN FRANCISCO - UPPER GILA RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	HOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAS. HAX. (% AVE.)	REAS. HIN. (% AVE.)	PEAK FLON (CFS)	PEAK DATE	LOH Floh (CFS)	LOH Date
SAN FRANCISCO RIVER at Glenwood	APR-HAY	15.4	10.0	64	214	24				
SAN FRANCISCO RIVER at Clifton	APR-MAY	31.0	19.0	åi	271	28				
GILA RIVER at Gila	APR-HAY	23.7	16.0	67	152	25				
SILA RIVER near Virden	APR-MAY	27.5	18.0	45	167	25				
CILA RIVER near Solomon	APR-HAY APRIL	57.0 37.3	34.0 24.0	59 64	277	25				
GILA RIVER at Calva (unadjusted)	APR-HAY	37.4	10.0	24	227	i i	ALCO TO THE PARTY OF THE PARTY			

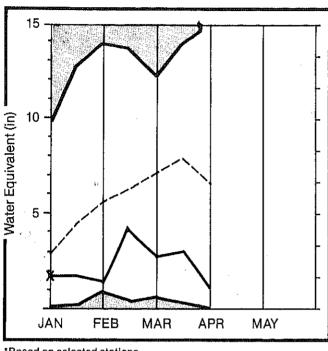
	RESERVOIR STORAGE	(1000AF) 	HATERSHED SA	IONPACK A	HALYSIS
REBERVOIR	USEABLE CAPACITY 	** USEABLE STORAGE ** I THIS LAST ! YEAR YEAR AVE. !	HATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF
SAN CARLOS PAINTED ROCK DAM	935.0 2492.0	705,4 945,9 320,2 0,0 274,2	SAN FRANCISCO/GILA RIVER	7	24 25

mCorrected for upstream diversions or changes in reservoir storage.

Average is for 1961-80 period.

Little Colorado River Basin

Mountain snowpack* (inches)

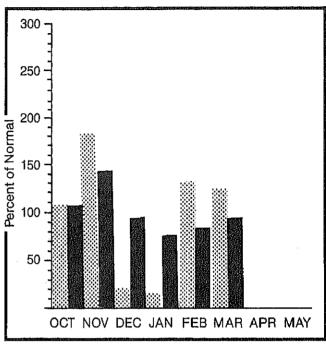


*Based on selected stations

Maximum Minimum

Average ————
Current

Precipitation* (percent of normal)



*Based on selected stations

Monthly precipitation

Year to date precipitation

April 1, 1986

WATER SUPPLY OUTLOOK:

April-June runoff on the upper Little Colorado River is forecast to be 68% of average at Greer and 54% at Lyman Reservoir. Precipitation in March was 125% of average. The snowpack built up during March but almost immediately melted. The April 1 snowpack was 15% of average. The Chuska Mountains are estimated to retain a 73% of average snowpack. Lyman Lake held 27,400 acre feet near April 1 and Show Low Lake, 3100 acre feet.

LITTLE COLORADO RIVER BASIN

STREAMFLOW FORECASTS

FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	HOST PROBABLE (1000AF)	HOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. HIN. (% AVE.)	PEAK Floh (CF8)	PEAK Date	LOH Floh (CF8)	LOH DATE
LITTLE COLORADO RIVER at Greer	APR-JUN	7,0	4.8	68	143	29				
ITTLE COLORADO RIVER ab Lyman Res	APR-JUN	11.0	6.0	54	127	18				
LITTLE COLORADO RIVER at Woodruff =	NOV-JUN	17.3	6,0	34	104	12				

	RESERVOIR STORAGE	(1000AF)	HATERSHED 1	SHOHPACK AN	ALYSIS
RESERVOIR	USEABLE CAPACITY 	## USEABLE STORAGE ## THIS LAST YEAR YEAR AVE.	WATERSHED	NO. COURSES AVE.D	THIS YEAR AS % GF
LYMAN RESERVOIR		27.4 30.0	LITTLE COLORADO RIVER	5	12 15
SHOW LOW LAKE	5.1	3.1 5.1	CHUSKA HOUNTAINS	. 5	52 (10 10 10 10 10 10 10 10 10 10 10 10 10 1

[#]Corrected for upstresm diversions or changes in reservoir storage.

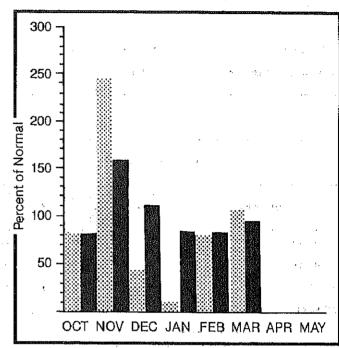
Average is for 1961-80 period.

Lower Colorado River Basin

Mountain snowpack* (inches) 15 10 JAN FEB MAR APR MAY *Based on selected stations



Precipitation* (percent of normal)



*Based on selected stations

Monthly precipitation

Year to date precipitation

April 1, 1986

WATER SUPPLY OUTLOOK:

The Colorado River is forecast to produce 10,800,000 acre feet inflow to Lake Powell at 144% of average for April-July. The Virgin River at Littlefield is forecast to run 96% of average over the April-June period. Northwestern Arizona received 105% of average precipitation during March. The April 1 snowpack in the Grand Canyon area was only 58% of average. Reservoir storage on April 1 for Lakes Powell, Mead, Mohave, and Havasu totaled 47,513,000 acre feet at 89% of capacity.

LOWER COLORADO RIVER BASIN

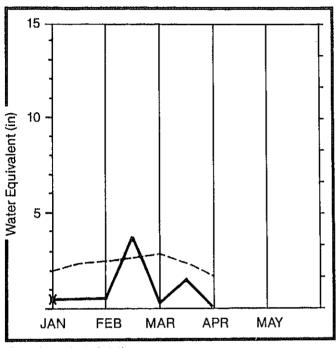
STREAMFLOW FORECASTS										
FORECAST POINT	FORECAST PERIOD	20 YR. AVE. (1000AF)	HOST PROBABLE (1000AF)	HOST PROBABLE (% AVE.)	REAS. MAX. (% AVE.)	REAS. MIN. (% AUE.)	PEAK FLON (CFS)	PEAK DATE	LOH FLOH (CFS)	LOH Date
VIRGIN RIVER near Littlefield	APR-JUN	62.0		ankirigi Bara P	127 173	77 120				
INFLOR to LAKE POWELL #	APR-JUL	7462.0	10800.0	1.14					uu	

	RESERVOIR STORAGE	(1000AF)	 WATERSHED 	SHOHPACK AN	ALYBIS
RESERVOIR	USEABLE CAPACITY 	** UBEABLE STORAGE ** THIS LAST YEAR YEAR AVE.	HATERSHED	NO. COURSES AVE.D	THIS YEAR AS % OF
LAKE HAVASU	619.4	556.6 573.0 556.0	LOWER COLORADO RIVER	2	\$1 00
LAKE HOHAVE	1810.0	1645/2 1732/8 1666/0	 		terior territoria. Programa
LAKE HEAD		20073(0 23861(0 18170(0	l		
LAKE POHELL	25002.0	226(1) 21898(0 (1280)6	1 1		

[#]Corrected for upstream diversions or changes in reservoir storage.
Average is for 1941-80 period.

Mimbres River Basin

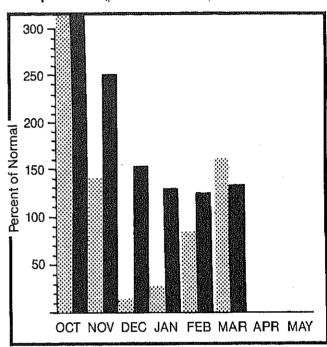
Mountain snowpack* (inches)



*Based on selected stations

Maximum Average ---Minimum Current

Precipitation* (percent of normal)



*Based on selected stations

Monthly precipitation

Year to date precipitation

April 1, 1986

WATER SUPPLY OUTLOOK:

Light runoff is expected on the Mimbres River during April-May. The forecast calls for only 500 acre feet or 25% of average. March precipitation was 162% of average but this has already run off. The snowpack on the Mimbres watershed was essentially gone as of April 1.

MIMBRES RIVER BASIN

STREAMFLOW FORECABTS												
FORECAST POINT	FORECAST		NOST PROBABLE (1000AF)	MOST PROBABLE (% AVE.)	REAB. HAX. (% AVE.)	REAS. HIN. (% AVE.)	PEAK FLOH (CFS)	PEAK	LOH FLOH		FON)H
	PERIOD	AVE. (1000AF)						DATE	(CFE		DATE	
MIMBRES RIVER near Himbres	APR-HAY	2.0	0.5	25	150	10					,,,	
	, 											
RESERVOIR	STORAGE	(1000AF) I			HATERSHED SHOMPACK ANALYBIS							
RESERVOIR	USEABLE I CAPACITY!	** USEABLE STORAL		E xx			NO. COURSES		THIS	YEAR	AS % C)F
		THIB YEAR	LAST YEAR	AVE, I	HATERSHED			VE•0			AVERAC	SE mma
				 	MIMBRES R	IVER		3	6		9	

^{*}Corrected for upstrese diversions or changes in reservoir storage. Average is for 1961-80 period.

DATA SITES USED TO DETERMINE SNOW PACK WATER

SALT RIVER

Baldy

Beaverhead Coronado Trail

Forest Dale Alternate Hannagan Meadows

Heber

Maverick Fork Workman Creek

VERDE RIVER

Baker Butte Baker Butte #2 Chalender

Copper Basin Divide

Fort Valley
Gaddes Canyon
Happy Jack
Mingus Mountain
Morman Mountain
Mormon Mt. Summit #2
White Horse Lake Jct.

Williams Ski Run

GILA/SAN FRANCISCO RIVER

Beaverhead Coronado Trail Frisco Divide Hannagan Meadows Signal Peak Snotel Silver Creek Divide State Line

LITTLE COLORADO RIVER

Baldy

Cheese Spring

Heber Nutrioso

Promontory Butte

LOWER COLORADO RIVER

Bright Angel Grand Canyon

SAN FRANCISCO PEAKS

Inner Basin #1 Inner Basin #2

Snow Bowl #1 Alternate

Snow Bowl #2

CHUSKA MOUNTAINS

Bowl Canyon Tsaile Canyon #1 Tsaile Canyon #2 Wheatfields Whiskey Creek

MIMBRES RIVER

Emory Pass #2 McKnight Cabin Signal Peak Snotel

STATIONS USED TO DETERMINE PERCENT OF NORMAL PRECIPITATION

SALT RIVER

Alpine R.S.
Baldy Snotel
Black River Pumps
Buck Spring Snotel
Coronado Trail Snotel
Hannagan Meadows Snotel
Heber Snotel
Maverick Fork Snotel
Pleasant Valley R.S.
Promontory Snotel
Sierra Ancha
Tonto Fish Hatchery
Wildcat Snotel
Workman Creek Snotel

LITTLE COLORADO RIVER

Baldy Snotel
Buck Spring Snotel
Flagstaff
Heber Snotel
Holbrook
Mormon Mountain Snotel
Promontory Snotel
Springerville
Tuba City
Window Rock

LOWER COLORADO RIVER

Bright Angel Colorado City Fredonia Grand Canyon Kingman Page Williams

VERDE RIVER

Ashfork
Baker Butte Snotel
Beaver Creek R.S.
Copper Basin Divide
Flagstaff
Fort Valley
Fry Snotel
Happy Jack
Mingus Mountain
Mormon Mountain Snotel
Payson R.S.
Prescott
Sugar Loaf Snotel
White Horse Lake Snotel

GILA/SAN FRANCISCO RIVER

Alpine R.S.
Beaverhead R.S.
Clifton
Coronado Trail Snotel
Frisco Divide Snotel
Hannagan Meadows Snotel
Lookout Mountain Snotel
Luna R.S.
Reserve R.S.
Safford Exp. Farm
Signal Peak Snotel
Silver City
Silver Creek Divide Snotel
Fort Bayard

MIMBRES RIVER

Mimbres R.S. Signal Peak Snotel



The Following Organizations Cooperate With The Soil Conservation Service in Snow Survey Work

Federal

Department of Agriculture

Soil Conservation Service

Forest Service

Apache-Sitgreaves National Forest

Coconino National Forest Coronado National Forest Gila National Forest Kaibab National Forest

Prescott National Forest Tonto National Forest

Rocky Mountain Forest and Range Experiment Station

Department of Commerce

NOAA, National Weather Service

Department of Interior

Bureau of Reclamation

Region III

Geological Survey

Arizona District

New Mexico District

Bureau of Indian Affairs

Navajo Reservation

San Carlos Irrigation Project

National Park Service

Grand Canyon National Park

Gila Water Commissioner Safford, Arizona

State

Arizona Department of Water Resources Arizona Game and Fish Department

Arizona State Parks Board

Arizona State University

Laboratory of Climatology (State Climatologist)

University of Arizona

Arizona Agricultural Experiment Station. Water Resource Research Center Department of Watershed Management

Municipal

City of Flagstaff

Irrigation Projects

Salt River Valley Water Users' Association

Phoenix, Arizona

San Carlos Irrigation and Drainage District

Coolidge, Arizona

Maricopa County Municipal Water Conservation District

Peoria, Arizona

Indian Tribes

Navajo Nation

Window Rock, Arizona

Private

Southwest Forest Industries, Inc.

Phoenix, Arizona

Other organizations and individuals furnish valuable information for the snow surve reports. Their cooperation is gratefully acknowledged.